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AUTHOR Vegas, Emiliana; Murnane, Richard J.; Willett, John B.
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ABSTRACT

The role of race and ethnicity in predicting who becomes a teacher was the subject of a study that used data from the sophomore cohort of the High School and Beyond study, a longitudinal survey that interviewed participants in 1980, 1982, 1984, 1986, and 1992. The focus was on the impact of academic skills into entry into teaching. Four dichotomous outcome variables were used: (1) graduation from high school; (2) entry into college; (3) graduation from college; and (4) entry into teaching. Predictors of interest were indicators of racial and ethnic background and of 10th-grade academic skills. The initial sample consisted of 11,816 high school sophomores, of whom 62% were White, 21% Hispanic American, 13% African American, 3% Asian American, and 2% American Indian. A total of 434 individuals became teachers, 3.7% of the original sample, and the highest percentage was for African Americans, 4.4% of whom became teachers. There are important differences among racial and ethnic groups in the rates of success along each step along the path to teaching, and each of the defined steps was critical in determining who became a teacher. Weak academic skills play a key role in limiting the opportunities of African American and Hispanic students. Analyses suggest that improving the academic preparation of African American and Hispanic high school students would close the gaps between their success rates relative to those of White students. Raising the average preparation of Native American students, however, would not be sufficient to eliminate those gaps. This paper shows that focusing only on the occupational decisions of college graduates misses critical obstacles to developing a racially and ethnically diverse, academically talented teaching force. Appendixes describe the variables, show the principal components analysis of 10th grade academic skills, and model each step of the path into teaching. (Contains 10 tables, 4 figures, and 11 references.) (SLD)

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From High School to Teaching: Many Steps. Who Makes It?

Emiliana Vegas, Richard J. Murnane, and John B. Willett
Harvard University

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From High School to Teaching: Many Steps. Who Makes It?

Emiliana Vegas, Richard J. Murnane, and John B. Willett
Harvard University

Over the next 10 years, the nation's teaching force will change dramatically as almost two million new teachers replace the large number of teachers currently nearing retirement age. What will the teaching force look like in the years ahead? Will it be racially and ethnically diverse? Will it consist of academically talented college graduates? Insights into the answers to these questions come from analyzing which high school students from the 1980s completed the long path into teaching. Steps along this path include high school graduation, college entry, college graduation, and, finally, entry into teaching.

In this paper, we focus on the role of race and ethnicity in predicting who becomes a teacher because we believe that in our increasingly heterogeneous society, children need to observe that adults from different ethnic backgrounds can effectively hold leadership positions in our society. Moreover, particularly for students of color, effective teachers of diverse racial and ethnic backgrounds may provide the inspiration and role models needed to succeed in school.

We focus on the impact of academic skills on entry into teaching because teaching well is a complex cognitive challenge requiring the ability to think and reason clearly. The positive correlations between teachers' scores on standardized tests and the test scores or test score gains of their students found in a number of studies support the notion that standardized test scores are an indicator of relevant academic skills for teachers (Coleman *et al.* 1966, Hanushek 1972, Summers & Wolfe, 1977, Ferguson 1990, Strauss & Sawyer 1990). This is why we believe it is important to attract academically talented college graduates to teaching. At the same time, we do

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not equate the test scores of potential teachers with their teaching effectiveness. Effective teaching requires many skills not measured by scores on multiple choice tests of reading and mathematics.

Most studies of the characteristics of entrants into teaching have focused on the occupational decisions of college graduates (for example: Vance and Schlechty 1982, Murnane *et al.* 1991, Hanushek and Pace 1995).[1] These studies show that college graduates who enter teaching tend to have lower academic skills (as measured by test scores) than graduates entering other professions. However, the occupational decisions of college graduates are their last in a series of steps that determines who becomes a teacher. In this paper, we examine the role that race/ethnicity and academic skills play in explaining students' success in completing each of these steps.

We show that the challenge of creating a racially and ethnically diverse teaching force is not primarily one of influencing the occupational decisions of Black, Hispanic, and Native American college graduates. Instead, the critical challenge is to increase the high school graduation, college enrollment, and college graduation rates of Black, Hispanic, and Native-American youth. We also show that low academic skills in high school are a critical factor explaining why relatively low percentages of Black, Hispanic, and Native American students complete both high school and college.

The paper is organized as follows. In Section I, we discuss our data and empirical strategy. In Section II, we present the findings of our analysis of who succeeds at each step of the path into teaching. Finally, in Section III, we present a discussion of our findings.

Research Design

Dataset and Sample

The sample consists of the sophomore cohort of High School and Beyond (HSB), a longitudinal survey that interviewed participants in 1980, 1982, 1984, 1986, and 1992. The last round of interviews in 1992 provides information on the initial career decisions of individuals in the sample.

Measures

We use four dichotomous outcome variables, one for each of the key steps along the path into teaching. These outcome variables represent: (1) graduation from high school; (2) entry into college; (3) graduation from college; and (4) entry into teaching.

The predictors of interest include indicators of racial and ethnic background and of tenth-grade academic skills. In all our analyses, we also control for gender and for important interactions among our predictors. The indicators of racial and ethnic background are a set of dummy variables representing: African American, Asian American, Hispanic, and Native American. The omitted group is White, non-Hispanic (to which, for ease of presentation, we will refer as simply White).

Our measure of tenth-grade academic skills is a composite of the scores that 1980 high school sophomores obtained in a battery of tests in science, math, reading, vocabulary, and writing. For each individual, we created a composite index of scores on the five tests using principal components analysis (see Appendix 2).

A detailed description of our measures is presented in Appendix 1, along with relevant descriptive statistics.

Statistical Analyses

In our analyses, we explore high school sophomores' career transitions along each step of the path into teaching. We analyze who graduates from high school, who enters college, who graduates from college, and, finally, who becomes a teacher. At each step of the path into teaching, we ask: (1) whether the probability of moving to the next step differs among individuals of different racial or ethnic origin, (2) whether the probability of moving to the next step is predicted by tenth-grade academic skills, and (3) whether individuals of different racial or ethnic origin *but with the same level of tenth-grade academic skills* have different probabilities of completing each step of the path into teaching.[2]

To answer the first question, we present a table displaying the percentage of each racial/ethnic group by gender that achieved each step.

To answer the second question, we use logistic regression analyses to examine whether succeeding in each step along the path into teaching is predicted by tenth-grade academic skills, controlling for gender and race/ethnicity. As part of this analysis, we explore whether the role of academic skills in predicting success at each step varies by gender and by racial/ethnic group.

To answer the third question, we use the fitted logistic regression models to construct plots displaying the probability of completing each step for substantively-interesting "prototypical" people. Given that teaching is a primarily female profession and because of limited space, we present these prototypical fitted plots of the probability of completing each step of the path into teaching for females by race/ethnic group. However, we note one instance where the fitted probabilities are significantly different for males – the fitted probability of entering teaching conditional on having graduated from college. Each prototypical plot extends between the 10^{th} and 90^{th} percentiles of test scores for females of each racial or ethnic group.[3] By

examining these prototypical fitted plots, we can assess the extent to which differences by race and ethnicity in the probabilities of completing each step of the path into teaching stem from differences in tenth-grade academic skills.

Findings

Our initial sample consisted of 11,816 high school sophomores in 1980. Of these, 62% were White, 21% were Hispanic, 13% were African American, 3% were Asian American, 2% were of Native American descent. A total of 434 individuals, or 3.7 percent of the original sample, became teachers in the period between 1986 and 1992. The percentages by racial/ethnic group vary considerably. The highest percentage is for African-American sophomores, 4.4% of whom became teachers. The percentage of White high school sophomores who became teachers is the same as the percentage of Native-American sophomores who did so, 3.7 percent. The percentages of Hispanic sophomores and Asian-American sophomores who became teachers are 3.3 and 2.9, respectively. These percentages, while interesting, mask enormous differences in the percentages of sophomores of each racial/ethnic group who succeed at each of the steps of the path into teaching. Understanding these differences is critical to targeting interventions aimed at increasing the number of students from particular racial/ethnic groups who enter teaching. It is to these individual steps that we now turn.

Who Graduates from High School?

Table 1 presents the percentages of high school sophomores in the sample who graduated from high school, by gender, race, and ethnicity. The figures presented in Table 1 show that females have slightly higher rates of high school graduation than males. They also show that

Native-American, Black, and Hispanic high school sophomores are less likely to obtain high school diplomas than are White and Asian-American sophomores.

Insert Table 1 about here

To what extent are the differences in high school graduation rates by race/ethnicity explained by differences in academic skills as measured by 10th grade test scores? As explained above, logistic regression analysis helps to answer this question. The protypical fitted curves in Figure 1 illustrate the contents of our final fitted logistic regression models (which are presented in Appendix 3, Table A3.1). Each of the curves in Figure 1 presents the fitted relationship between tenth-grade test score and probability of high school graduation for females of a particular racial/ethnic group. The positive slopes of all the curves in Figure 1 illustrate that among students in every racial-ethnic group, those with higher tenth grade test scores were more likely to graduate from high school.

Insert Figure 1 about here

If differences in high school graduation rates by race/ethnicity were explained entirely by differences in average tenth-grade test scores, there would be only one curve in Figure 1. The vertical distances between the curves corresponding to different racial/ethnic groups illustrate that there are differences in high school graduation rates by racial/ethnic group for high school sophomores with the same 10th grade test scores. In particular, Asian-American students (the top curve in Figure 1) are more likely to graduate than are students from other racial/ethnic groups who have the same 10th grade test scores. In contrast, throughout most of the test score range, Native-American students (the bottom curve for most of Figure 1) are less likely to graduate than are students from other racial/ethnic groups with the same tenth grade scores. The curves for White, African-American, and Hispanic students in Figure 1 are quite close, illustrating that

students from these groups who had the same tenth grade test scores had about the same probability of graduating from high school.

Yet as we know from Table 1, Black and Hispanic students (as well as Native-American students) were less likely to graduate from high school than were Whites. Much of the explanation for these differences lies in heterogeneity in tenth grade test scores. Black, Hispanic, and Native-American children in our society are much more likely to grow up in low-income families than are White, non-Hispanic children. They are also much more likely to attend low-quality schools than are White youth. One critical way in which these handicaps manifest themselves is in weak academic skills – skills that are of great importance in acquiring educational credentials.

Each solid circle in Figure 1 illustrates the predicted high school graduation rate for a female with the average tenth-grade test score for females in her racial/ethnic group. The fact that the circles for African-American, Hispanic, and Native-American students lie to the left of those for White and Asian-American students illustrates that the average tenth grade test scores of the former groups are considerably lower than those of the latter groups. The dashed lines connecting the solid circles to the vertical axis illustrate that the lower high school graduation rates of Black students and Hispanic students (as shown in Table 1 and by the vertical ranking of the horizontal lines in Figure 1) can be explained by differences in tenth grade test scores. In fact, throughout most of the test score range, African-American females were more likely to graduate from high school than were White females with the same test scores.

Differences in the ranges of tenth-grade academic skills by race and ethnicity are worth highlighting. Whites and Asian-American high school sophomores tend to have higher tenth-

grade academic skills than Hispanics, African-Americans, and Native Americans. This implies that if we were to choose an African-American, Native-American, or Hispanic person at random from the population, the probability s/he is a high school graduate will be lower than if the person were White or Asian American because of the existing differences in ranges of tenth-grade academic skills by race/ethnicity. But if we were to select two individuals with the *same* tenth-grade academic skills level but different race and ethnicity, the probability that the person is a high school graduate is higher for African Americans and Hispanics than for Whites (and Native Americans). Thus, tenth-grade academic skills account for most of the variation by race/ethnicity in the probability of high school graduation.

Who Enters College?

Patterns of college entry are different from those of high school graduation. Table 2 shows that, among Black, Hispanic, and Native-American high school graduates, *females* are more likely to enter college than males. In contrast, among high school graduates of White or Asian-American backgrounds, *males* are more likely to enter college.

Insert Table 2 about here.

As in the case of high school graduation, there are considerable differences in the probability of college entry by race and ethnicity. Asian-American high school graduates have the highest rate of college entry (80.6% for males and 78.4% for females). But African-American high school graduates have the second-highest rate, with about 69% female and 67% male of high school graduates in this race group entering college. About 64% of White female and 67% of White male high school graduates in the sample entered college. As in the case of high school graduation, Hispanic and Native American high school graduates' college entry rates lag behind those of Whites and Asian Americans.

Figure 2 presents prototypical fitted curves of the probability of entering college for female high school graduates in each race and ethnic group by tenth-grade academic skills (see Appendix 3, Table A3.2 for the fitted models). The positive slopes of the curves in Figure 2 illustrate that, in all racial/ethnic groups, those high school graduates with strong academic skills, as measured by tenth grade test scores, were more likely to enroll in college than graduates with lower academic skills.

Insert Figure 2 about here

Figure 2 also shows that, among female high school graduates with the same tenth-grade academic skills, African-Americans have the highest estimated probability of entering college, closely followed by Asian-Americans. Next in line are Hispanic students, then White students. Among high school graduates with the same tenth-grade test scores, Native-Americans have the lowest probability of enrolling in college.

How important are tenth grade academic skills in explaining differences in college enrollment rates by racial/ethnic group? Figure 2 illustrates that the answer varies by racial/ethnic group. If the average 10th grade test score of African-American female high school graduates were as high as the average tenth grade score of Asian-American female graduates, their predicted college enrollment rate would be just as high—in fact, slightly higher. The figure illustrates that most African-American high school graduates with solid academic skills do enroll in college. The problem is that many African-American high school graduates have relatively weak academic skills, as measured by 10th grade test scores.

In contrast, low tenth grade test scores cannot explain the low college enrollment rate of Native-American high school graduates. In fact, the average tenth grade score for Native-American female high school graduates is only slightly lower than the average 10th grade score

for Asian-American female graduates. Yet the college enrollment rate of Native-American high school graduates is not much more than half that of Asian-American high school graduates.

Who Obtains a Bachelor's Degree?

Among students who enroll in college, Asian-Americans have the highest graduation rate, followed by Whites. The graduation rates of Hispanic and Black students are considerably lower, and that of Native-Americans is by far the lowest (See Table 3).

Insert Table 3 about here.

How much of the differences can be explained by differences in the quality of students' preparation for college, as measured by tenth-grade academic skills? Figure 3 illustrates the answer. In all racial/ethnic groups, college students with relatively high tenth grade test scores were more likely to graduate than students with low tenth grade scores. But the vertical distances between the curves illustrate that there are important differences among racial/ethnic groups in the graduation rates of college students with the same tenth grade academic skills.

Among college enrollees with the same tenth-grade academic skills, Asian-Americans are the most likely to graduate. The graduation rates of White, Black, and Native-American college enrollees with the same tenth-grade academic skills are about the same, lower than that of Asian-American college students, but considerably higher than that of Native-American college students. An implication of this pattern is that increasing the quality of Black and Hispanic students' preparation for college would significantly reduce the gap between their college graduation rates and that of White college students. Among Native-American college enrollees, those with strong high school academic skills are more likely to graduate from college than those with relatively weak high school academic skills.

However, even among those Native-American students with relatively strong academic skills, the estimated graduation rate is much lower than the estimated graduation rate for students from other racial/ethnic groups with the same level of tenth-grade academic skills. Once again, this suggests that improving academic preparation is not enough to close the gap between the educational attainments of Native-American college students and those of White college students.

Insert Figure 3 about here

Who Enters Teaching?

Table 4 presents the percentages of college graduates by gender in each racial/ethnic group who entered teaching.[4] Female college graduates of all racial and ethnic groups were more likely to enter teaching than their male counterparts. Among college graduates in the sample, Native Americans, African Americans, and Hispanics have the highest percentages of teacher entry (58%, 29%, and 24% respectively for females; and 7.1%, 10.6%, and 10.4% respectively for males). About 18% of White female college graduates in the sample entered teaching, whereas only about 5% of White male college graduates did so. The group with the lowest rate of teacher entry in the sample is Asian-American college graduates, with 9% of females and 3% of males in the sample having chosen to become teachers.

Insert Table 4 about here.

The prototypical fitted plots in the first panel of Figure 4 (see Appendix 3, Table A3.4 for the fitted models) illustrate that for every racial/ethnic group, female college graduates with strong academic skills as measured by tenth grade test scores were less likely to become teachers than were graduates with weaker academic skills. This pattern, which has been reported in other studies (for example: Murnane *et al.* 1991, Hanushek and Pace 1995), is not difficult to explain

Teaching is a relatively low-status, low paying occupation, and one in which there are few financial rewards for excellence. Academically talented college graduates are drawn to occupations with greater prestige and compensation.

Insert Figure 4 about here

In fact, what is of greater surprise than the downward slopes of the fitted curves in panel (a) of Figure 4 is the relative flatness of the curves for Whites, African Americans, and Asian Americans. The flatness indicates that for these groups, there is not a large difference between the probability that academically talented college graduates enter teaching and the probability that less talented graduates become teachers. For example, the predicted probability of becoming a teacher for a White female college graduate whose tenth-grade test score was at the 90th percentile for her group is 0.15, compared to 0.12 for a White female college graduate with a score at the corresponding 10th percentile. The corresponding figures for African-American female college graduates are 0.19 and 0.16. These patterns indicate that in the late 1980s and early 1990s it was by no means the case that among African-American, White, and Asian-American female college graduates, only those with weak academic skills became teachers.

In contrast, this claim is much more true for Hispanic female college graduates. Only one in ten Hispanic female college graduates with test scores at the 90th percentile for their group is predicted to enter teaching compared to one in four Hispanic female graduates with test scores at the 10th percentile for the group. This is a disturbing pattern. Hispanics are the most rapidly growing group in the U.S. student population. If the country is to have a teaching force demographically similar to its student population, schools will need to hire a great many Hispanic teachers in the years ahead. These new teachers must not be the least academically talented Hispanic college graduates.

Though not surprising, it is noteworthy that the fitted probability of entering teaching for male college graduates are significantly lower than those for female college graduates at all levels of tenth-grade academic skills, as illustrated in panel (b) of Figure 4. In addition, the slopes of the prototypical fitted curves for African-American, White, and Asian-American male college graduates are slightly upward sloping. This suggests that, in contrast to our findings for females, males of these racial/ethnic groups with high tenth-grade academic skills have a *higher* estimated probability of entering teaching than males with low tenth-grade academic skills. However, this is not the case among Hispanic male college graduates, for whom the prototypical fitted curve has a flat slope, indicating that there are no differences in the fitted probability of entering teaching by tenth-grade academic skills for males of this ethnic group.

Figure 4 helps to better understand the patterns of teacher entry by race displayed in Table 4. Comparing females with the same tenth-grade academic skills, African-American college graduates were more likely to become teachers than were White and Asian-American college graduates. This may reflect barriers that Black females face in gaining entry into other professions. The significant vertical distances between the curves in Figure 4 illustrate that differences in the probability that college graduates of different races and ethnic backgrounds enter teaching does not stem primarily from differences in average tenth grade test scores. In fact, for every group except Hispanics, test scores play only a modest role in explaining differences by race/ethnicity in the percentages that female college graduates become teachers.

Discussion

In this paper, we have shown that there are important differences among racial/ethnic groups in the rates of success at each step along the path into teaching. The early steps in the

path into teaching – high school graduation, college entry, and college graduation – are critical in explaining racial and ethnic differences in who becomes a teacher. Weak academic skills relative to those of Whites and Asian Americans play a key role in limiting Black students' and Hispanic students' opportunities of succeeding at each of these early steps.

Our analyses suggest that improving the academic preparation of African-American and Hispanic high school students would close the gaps between their success rates relative to those of White students in achieving high school graduation, college enrollment, and college graduation. Raising the average academic skills of Native-American high school students would also contribute markedly to the educational attainment of Native-American students. However, unlike the case for Black students and Hispanic students, raising the average academic preparation of Native American high school students to that of White high school students would not eliminate the gaps between these groups' high school graduation, college enrollment, and college graduation rates. Native-American students appear to face particular difficulties in acquiring the educational credentials that are increasingly valued in today's labor market (Gottschalk, 1997) and are necessary steps along the path into teaching and other professions.

In summary, this paper has shown that focusing only on the occupational decisions of college graduates misses critical obstacles to developing a racially and ethnically diverse, academically talented teaching force. Increasing the number of Black and Hispanic students who graduate from high school, enroll in college and graduate from college is the key to increasing the representation of these groups in the teaching force. In fact, Black college graduates are much more likely to enter teaching than are White college graduates, and this is just as true for graduates with very strong academic skills as it is for graduates with weaker academic skills. The problem is that there are not enough Black college graduates and Hispanic college

graduates. Only 21% of African-American, 17% of Hispanic, and 12% of Native-American high school sophomores in 1980 graduated from college by 1992, compared to 50% of Asian Americans and 32% of Whites. Weak academic skills are an important part of the explanation of these gaps, especially for African Americans and Hispanics.

We began this paper by asking what the nation's teaching force will look like in the years ahead. In particular, we asked whether it will be a racially diverse, academically talented teaching force. We have shown that the answer to these questions will depend to a great extent on the nation's success in improving the quality of education provided in the nation's elementary and secondary schools. A strikingly high percentage of American students with strong academic skills graduate from high school, enroll in college, and graduate from college. The problem is that too many students, especially African-American, Hispanic, and Native-American students, reach tenth grade without strong academic skills. Progress in solving this problem is the key to creating a racially and ethnically diverse, academically talented teaching force in the future.

Table 1: Percentages of High School Sophomores Graduating from High School, by Race/Ethnicity and Gender

	Males	Females
African American	78.5	82.6
Asian American	91.4	94.4
Hispanic	79.6	80.7
Native American	77.2	81.7
White	85.2	89.4

Table 2: Percentages of High School Graduates Entering College, by Race/Ethnicity and Gender

	Males	Females
African American	66.7	68.6
Asian American	80.6	78.4
Hispanic	53.8	58.4
Native American	44.3	52.9
White	67.0	64.4

Table 3: Percentages of College Entrants Obtaining a Bachelor's Degree by Race/Ethnicity and Gender

	Males	Females
African American	40.3	37.7
Asian American	67.9	67.5
Hispanic	39.8	42.3
Native American	35.9	26.7
White	56.0	54.5

Table 4: Sample Percentages of College Graduates Entering Teaching, by Race/Ethnicity and Gender

	Males	Females
African American	10.6	28.7
Asian American	2.6	8.6
Hispanic	10.4	24.1
Native American	7.1	58.3
White	5.4	17.5

Figure 1: Fitted Probability of the High School Graduation of Females as a Function of Tenth-Grade Academic Skills, by Race/Ethnicity

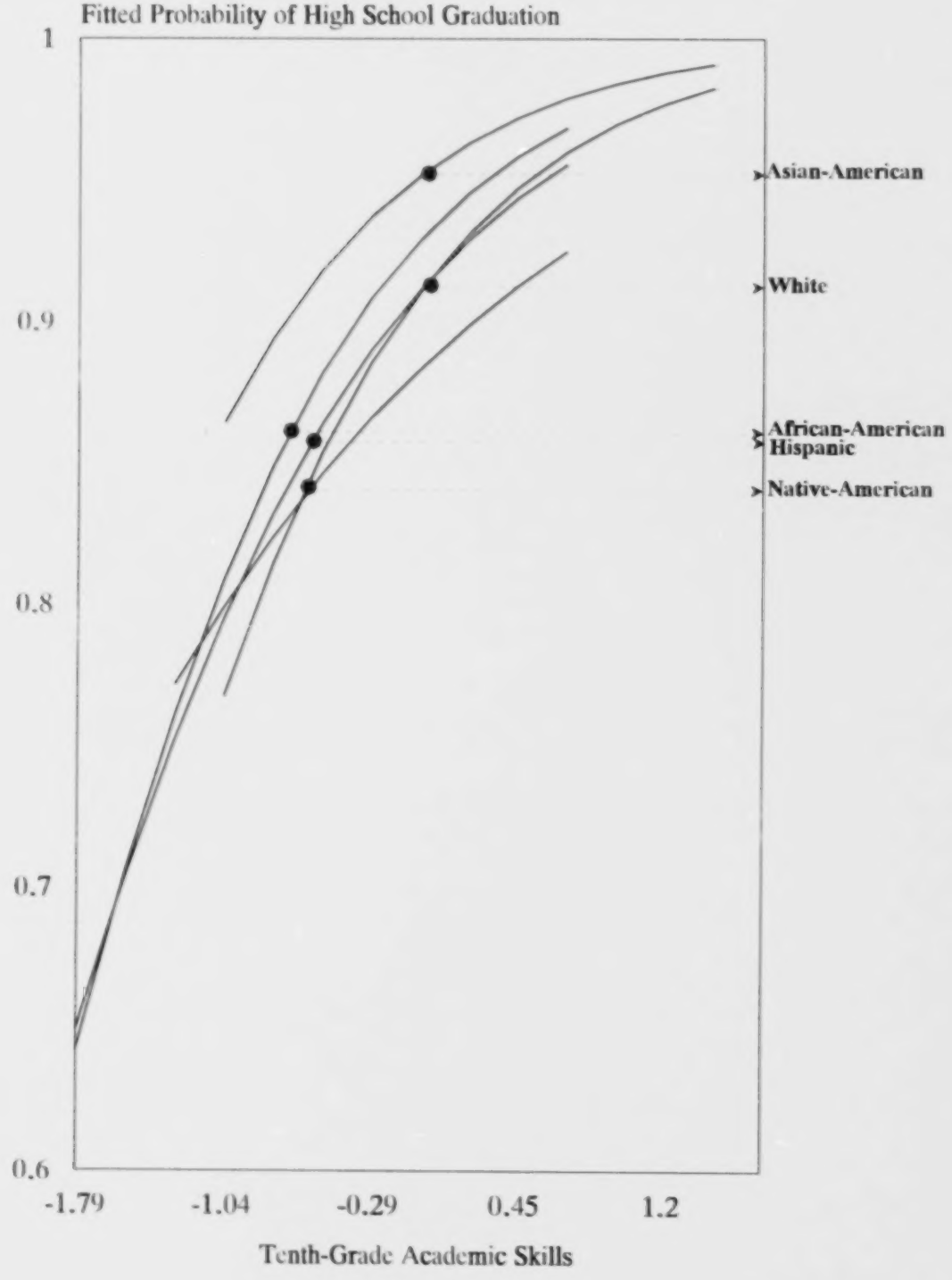


Figure 2: Fitted Probability of the College Entry of Females as a Function of Tenth-Grade Academic Skills, by Race/Ethnicity

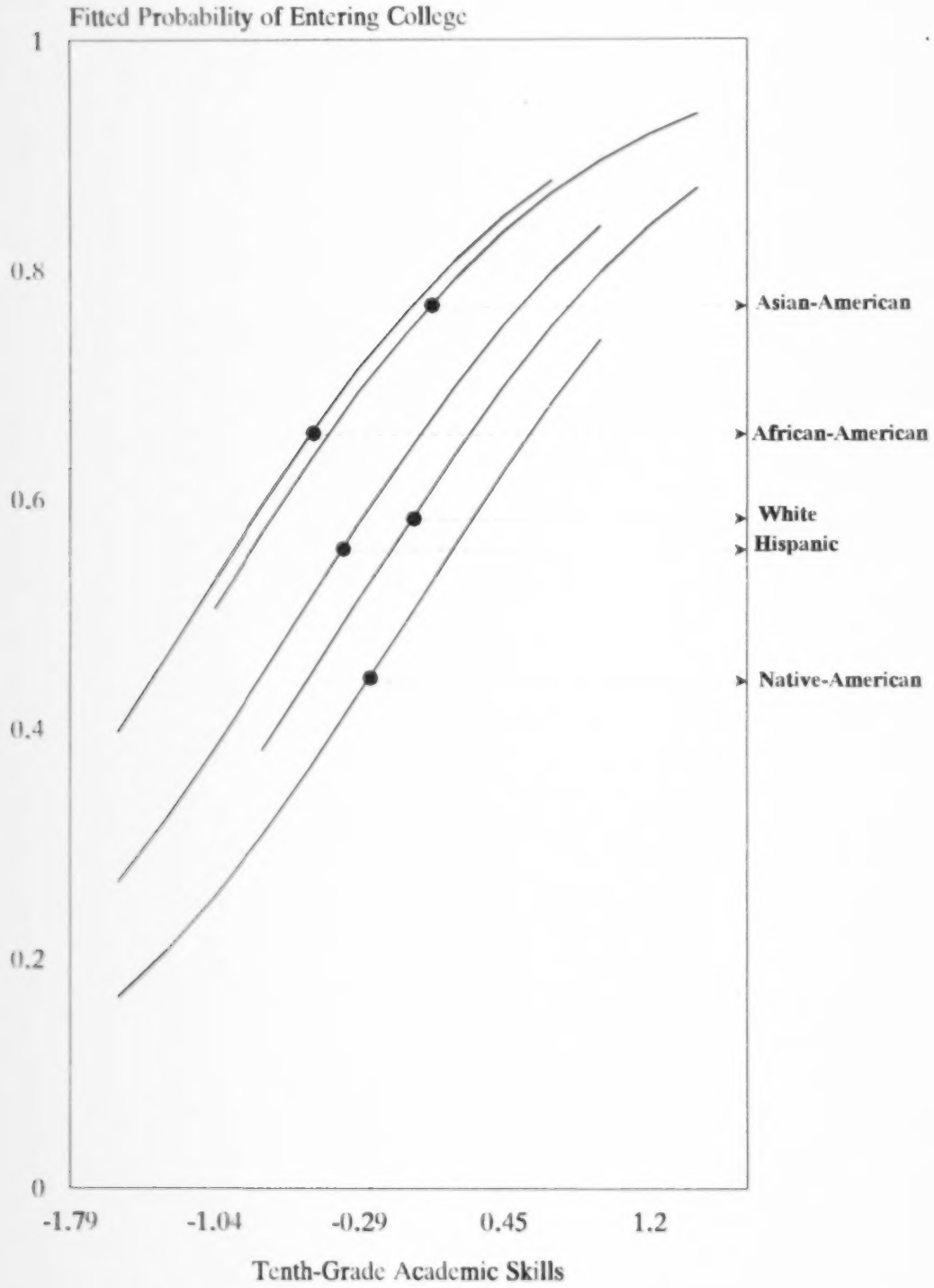


Figure 3: Fitted Probability of the College Graduation of Females as a Function of Tenth-Grade Academic Skills, by Race/Ethnicity

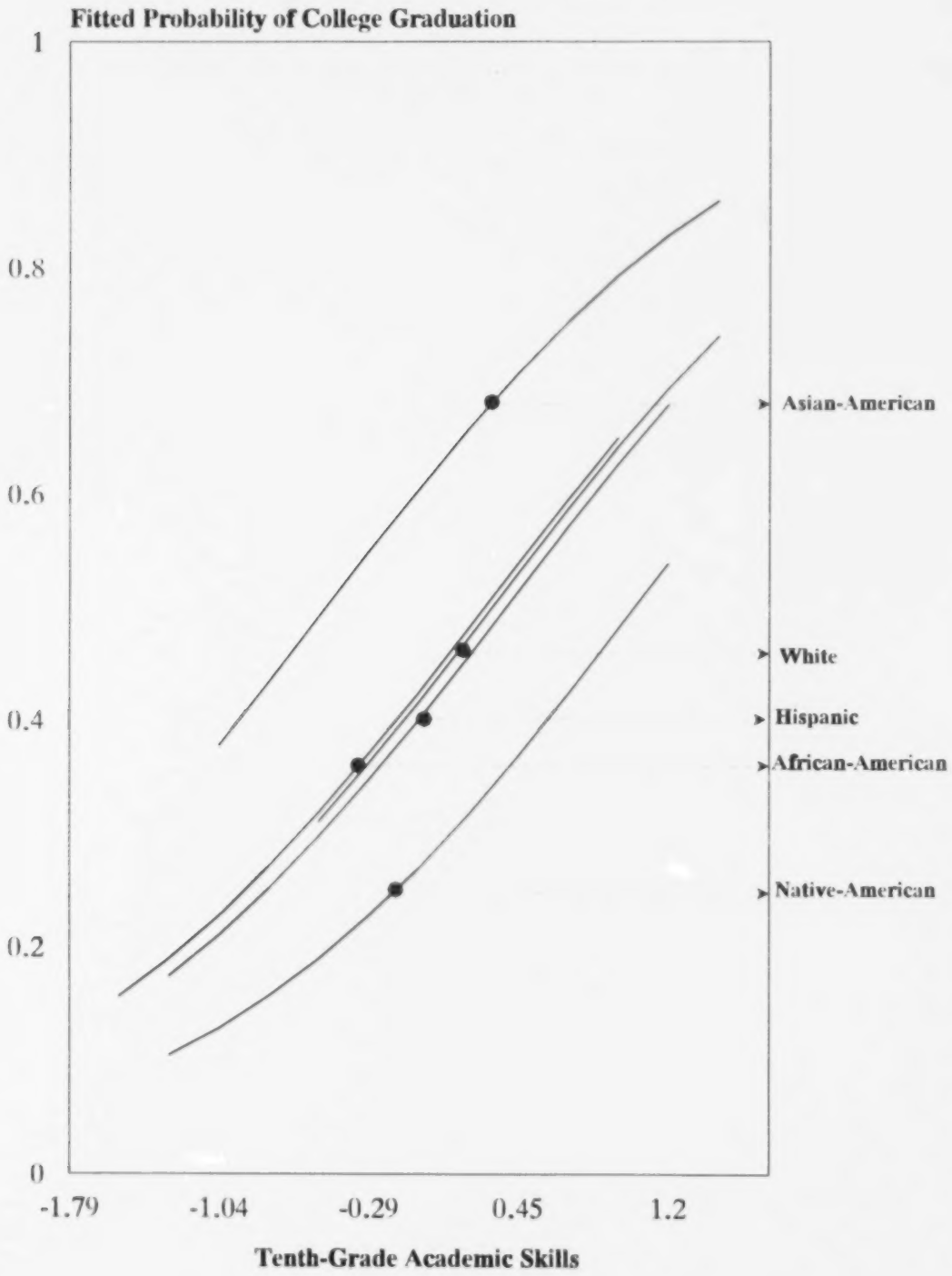
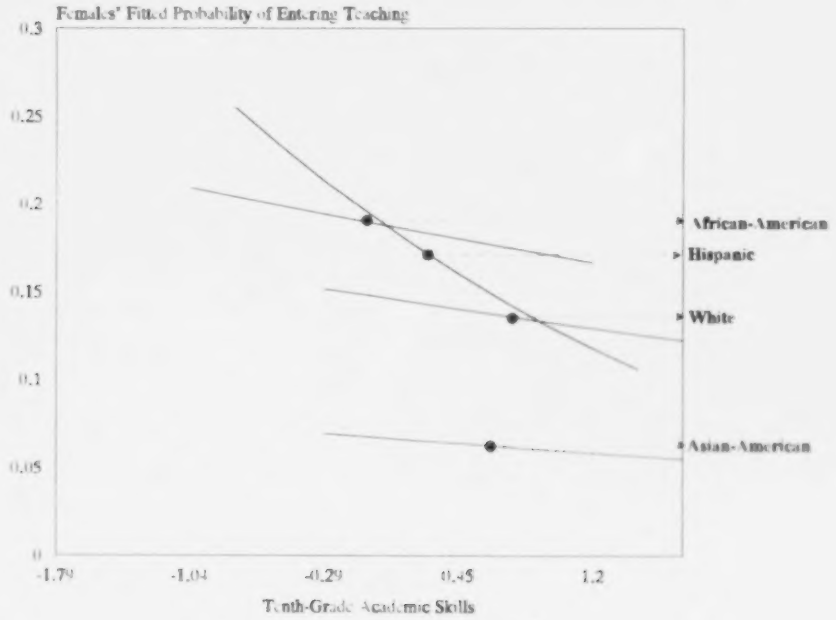
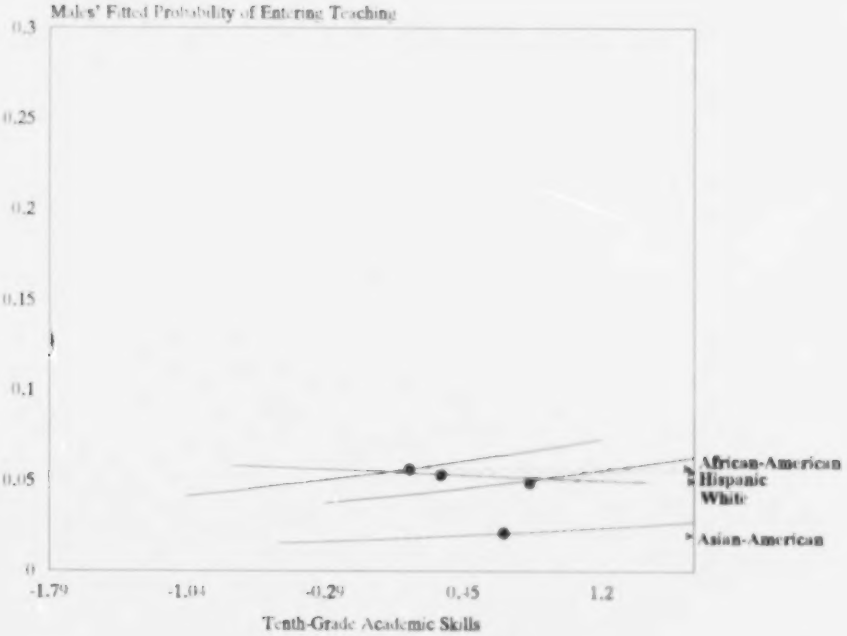


Figure 4: Fitted Probability of the Teacher Entry of Females and Males as a Function of Tenth-Grade Academic Skills, by Race/Ethnicity



(a)



(b)

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Appendix 1:
Description of Variables

Insert Table A1 about here.

Table A1.1: Variable Definitions

Variable Name	Definition
HSGRAD	a dichotomous variable that takes on the value 1 if the individual is a high school graduate and 0 otherwise.
ENTCOL	a dichotomous variable that takes on the value 1 if the individual entered a 2- or 4-year college and 0 otherwise.
BAGRAD	a dichotomous variable that takes on the value 1 if the individual is a 4-year college graduate and 0 otherwise.
TEACHER	a dichotomous variable that takes on the value 1 if the individual ever declared to be a teacher as his/her occupation and 0 otherwise.
HISPANIC	a dichotomous variable that takes on the value 1 if the individual is of Hispanic origin and 0 otherwise.
NATIVE	a dichotomous variable that takes on the value 1 if the individual is of Native-American origin and 0 otherwise.
ASIAN	a dichotomous variable that takes on the value 1 if the individual is of Asian-American origin and 0 otherwise.
BLACK	a dichotomous variable that takes on the value 1 if the individual is of African-American origin and 0 otherwise.
WHITE	a dichotomous variable that takes on the value 1 if the individual is of White origin and 0 otherwise.
IRT FACTOR SCORE	a continuous variable that contains a composite of the individual's scores on a battery of IRT tests in 1980, including reading, writing, vocabulary, math, and science. See Appendix 2 for details on how this composite was created.

Table A1.2: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
HSGRAD	0.862			
ENTCOL	0.560			
BAGRAD	0.289			
TEACHER	0.038			
HISPANIC	0.199			
INDIAN	0.019			
ASIAN	0.026			
BLACK	0.117			
WHITE	0.640			
IRT FACTOR SCORE	0.004	1.928	-4.298	4.980

Appendix 2: Principal Components Analysis of Tenth-grade Academic Skills

The results of a principal components analysis of the five IRT tests -- vocabulary, reading, math, science, and writing -- are presented in Table A1.

Table A2: Principal Components Analysis

Component	Eigenvalue	Variable	Eigenvector
1	3.72	IRT vocabulary	0.45
2	0.40	IRT reading	0.46
3	0.36	IRT math	0.45
4	0.27	IRT science	0.45
5	0.26	IRT writing	0.43

In the second column, we display the eigenvalues for each measure. The first principal component has a much higher eigenvalue than the other four (3.72) and accounts for 74% of the total variance. A scree plot of eigenvalues against the component numbers indicates that the first component is the most important, suggesting that the five scores can be effectively composited into a single indicator.

Examining the eigenvectors (or loadings) of each test of the first principal component, one can see that the five tests contribute almost equally. To score high on this component, an individual would have to score high in all five IRT tests. This suggests that this principal component measures overall student achievement.

Appendix 3:
Fitted Logistic Regression Models at Each Step of the Path into Teaching

Table A3.1: Fitted Logistic Regression Analyses of the Probability of High School Graduation by Gender, Race/Ethnicity, and Tenth-Grade Academic Skills (n = 10584)

	Model		
	A	B	C
Intercept	2.165*	2.393*	2.377*
	(0.048)	(0.062)	(0.061)
Male	-0.290*	-0.442*	-0.442*
	(0.057)	(0.076)	(0.076)
Hispanic	-0.526*	-0.017	-0.001
	(0.068)	(0.102)	(0.101)
Native American	-0.568*	-0.339	-0.323
	(0.185)	(0.259)	(0.245
Asian American	0.522~	0.435	0.655*
	(0.235)	(0.253)	(0.245)
African American	-0.498*	0.108	0.247*
	(0.084	(0.138)	(0.092)
Standardized IRT Score		1.180*	1.138*
		(0.064)	(0.060)
Std. IRT * Male		-0.176~	-0.172~
		(0.071)	(0.071)
Std. IRT * Hispanic		-0.194~	-0.156
		(0.089)	(0.086)
Std. IRT * Native American		-0.527~	-0.489~
		(0.227)	(0.226)
Std. IRT * Asian American		-0.462	
		(0.244)	
Std. IRT * African American		-0.159	
		(0.115)	
Pseudo- R^2	0.014	0.119	0.119

Notes: (1) Standard errors in parentheses with $p < 0.05$ = ~, $p < 0.01$ = *.
(2) General Linear Hypothesis tests were conducted of the joint effects of race, the joint effect of standardized IRT score and its interaction with male, the joint effect of standardized IRT score and its interaction with each race group, and the joint effects of all the interactions of standardized IRT score with each race group. In all of these tests, the null hypothesis that the coefficients are zero in the population can be rejected at the 5% level.

Table A3.2: Fitted Logistic Regression Analyses of the Probability of Entering College by Gender, Race/Ethnicity, and Tenth-Grade Academic Skills (n=9125)

	Model		
	A	B	C
Intercept	0.547*	0.354*	0.358*
	(0.034)	(0.037)	(0.037)
Male	0.017*	-0.056*	-0.057*
	(0.043)	(0.048)	(0.048)
Hispanic	-0.426*	0.264*	0.268*
	(0.055)	(0.069)	(0.064)
Native American	-0.987*	-0.358	-0.331
	(0.164)	(0.196)	(0.184)
Asian American	0.528*	0.758*	0.765*
	(0.147)	(0.165)	(0.163)
African American	-0.0015*	0.795*	0.863*
	(0.070)	(0.099)	(0.081)
Standardized IRT Score		1.093*	1.065*
		(0.047)	(0.041)
Std. IRT * Male		0.077~	0.077~
		(0.056)	(0.056)
Std. IRT * Hispanic		-0.042~	-0.156
		(0.076)	(0.086)
Std. IRT * Native American		-0.113~	-0.489~
		(0.213)	(0.226)
Std. IRT * Asian American		-0.083	
		(0.184)	
Std. IRT * African American		-0.130	
		(0.098)	
Pseudo-R^2	0.009	0.147	0.147

Notes: (1) Standard errors in parentheses with $p<0.05$ = ~, $p<0.01$ = *.
(2) General Linear Hypothesis tests were conducted of the joint effects of race, the joint effect of standardized IRT score and its interaction with male, the joint effect of standardized IRT score and its interaction with each race group, and the joint effects of all the interactions of standardized IRT score with each race group. The null hypothesis that the coefficients are zero in the population can be rejected at the 5% level in all the tests except for the test of the joint effects of all the interactions between standardized IRT score and race/ethnicity. In this test, we cannot reject the null hypothesis that all the coefficients are simultaneously zero in the population.

Table A3.3: Fitted Logistic Regression Analyses of the Probability of Obtaining a B.A. Degree by Gender, Race/Ethnicity, and Tenth-Grade Academic Skills (n=5924)

	Model		
	A	B	C
Intercept	0.148*	-0.296*	-0.295*
	(0.040)	(0.050)	(0.048)
Male	0.052*	0.005*	0.005*
	(0.053)	(0.061)	(0.061)
Hispanic	-0.513*	-0.063~	-0.065*
	(0.072)	(0.081)	(0.079)
Native American	-1.079*	-0.663~	-0.658~
	(0.261)	(0.285)	(0.276)
Asian American	0.550*	0.750*	0.760*
	(0.153)	(0.171)	(0.164)
African American	-0.596*	0.033*	0.035*
	(0.083)	(0.093)	(0.092)
Standardized IRT Score		0.929*	0.926*
		(0.057)	(0.049)
Std. IRT * Male		-0.157~	-0.156~
		(0.068)	(0.067)
Std. IRT * Hispanic		-0.004~	-0.156
		(0.094)	(0.086)
Std. IRT * Native American		0.034~	-0.489~
		(0.322)	(0.226)
Std. IRT * Asian American		0.050	
		(0.191)	
Std. IRT * African American		-0.032	
		(0.106)	
Pseudo-R^2	0.016	0.096	0.096

Notes: (1) Standard errors in parentheses with $p<0.05$ = ~, $p<0.01$ = *.
(2) General Linear Hypothesis tests were conducted of the joint effects of race, the joint effect of standardized IRT score and its interaction with male, the joint effect of standardized IRT score and its interaction with each race group, and the joint effects of all the interactions of standardized IRT score with each race group. The null hypothesis that the coefficients are zero in the population can be rejected at the 5% level in all the tests except for the test of the joint effects of all the interactions between standardized IRT score and race/ethnicity. In this test, we cannot reject the null hypothesis that all the coefficients are simultaneously zero in the population.

Table A3.4: Fitted Logistic Regression Analyses of the Probability of Becoming a Teacher by Gender, Race/Ethnicity, and Tenth-Grade Academic Skills (n=3037)

	Model		
	A	B	C
Intercept	-1.834*	-1.689*	-1.760*
	(0.082)	(0.112)	(0.109)
Male	-1.140*	-1.416*	-1.404*
	(0.140)	(0.194)	(0.193)
Hispanic	0.258*	0.244*	0.313*
	(0.170)	(0.189)	(0.187)
Asian American	-0.871~	-1.825~	-0.872~
	(0.426)	(0.831)	(0.426)
African American	0.332*	0.192*	0.298*
	(0.193)	(0.213)	(0.204)
Standardized IRT Score		-0.216*	-0.126*
		(0.111)	(0.101)
Std. IRT * Male		0.402~	0.395~
		(0.176)	(0.174)
Std. IRT * Hispanic		-0.259~	-0.348
		(0.212)	(0.207)
Std. IRT * Asian American		1.043	
		(0.620)	
Std. IRT * African American		0.343	
		(0.228)	
Pseudo- R^2	0.044	0.052	0.049

Notes: (1) Standard errors in parentheses with $p<0.05$ = ~, $p<0.01$ = *.
(2) General Linear Hypothesis tests were conducted of the joint effects of race, the joint effect of standardized IRT score and its interaction with male, the joint effect of standardized IRT score and its interaction with each race group, and the joint effects of all the interactions of standardized IRT score with each race group. The null hypothesis that the coefficients are zero in the population can be rejected at the 5% level in all the tests except for the test of the joint effects of all the interactions between standardized IRT score and race/ethnicity. In this test, we cannot reject the null hypothesis that all the coefficients are simultaneously zero in the population.